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Industrial-Scale H_2 Production From C1-Substrates At Near Ambient P,T: The Technology Of Nanohybrid Molecular Catalysts

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Extended Abstract

Catalytic H_2-production under mild, near ambient P, T, conditions from C1-substrates, represents a highly potent technology within the context of the forthcoming Hydrogen-Economy. H_2-production at high-rates complying with industrial-scale needs i.e. Kg H_2/hour is a next-leap forwards. Catalytic FA dehydrogenation is currently an advanced H_2-production approach [1,2].

Herein we discuss Hybrid-Catalytic materials based on Transition-Metals-Molecular-Catalysts [3,4], demonstrating high performance and selectivity with H_2-production rates >>10^3Lt/Kg catalyst/hour with zero CO. Innovative Hybrid Molecular Catalysts for FA dehydrogenation developed by [Fe/{N}] and [Fe/{N,P}] catalysts grafted on silica particles present high recyclability providing TONs>180000 and gasses' production V=74L from catalytic decomposition of 52 ml HCOOH. Moreover, we discuss efficient Hybrid Molecular Catalysts associated with silica nanoparticles and silica coated magnetic nanoparticles for H_2 production from HCHO.

Mechanistic insights will be highlighted regarding the role of initial Hydride-Metal species formation, the role/need-or-not of cocatalysts [5], the contribution of the support matrix, the role of inhibitory factors. Finally, we will focus on the techno-economical aspects connected with synthesis routes and limitations towards industrial-scale implementation.

References

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